Space Network Overview

Tom Gitlin

Deputy Project Manager

Space Network Project Office
NASA Goddard Code 452

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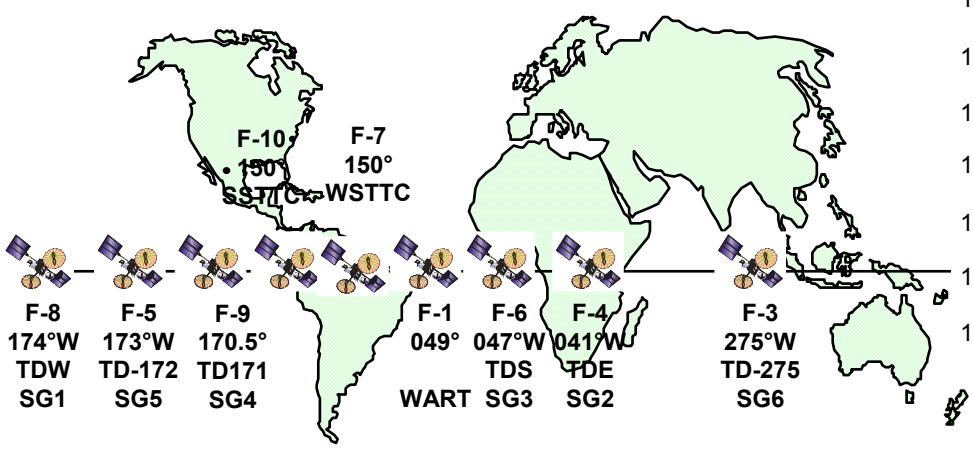
AGENDA

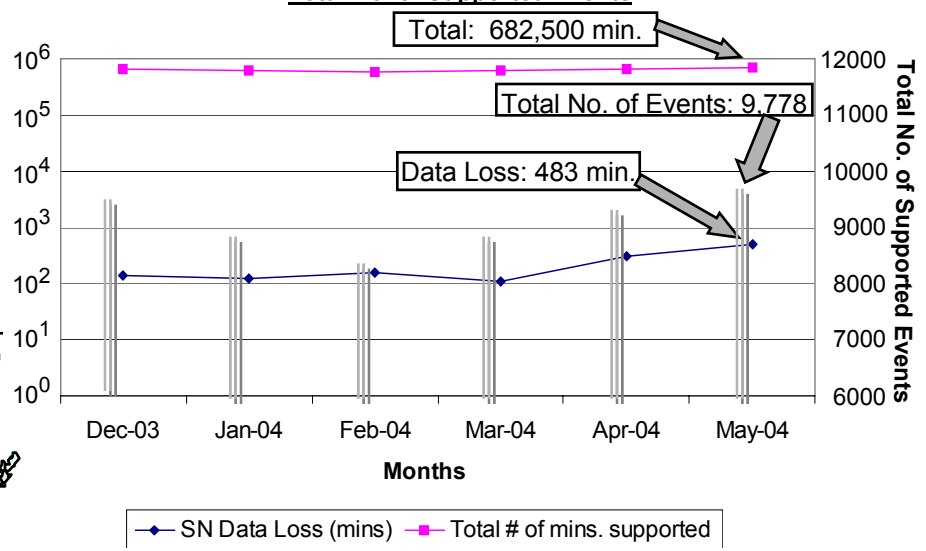
1. Space Network At A Glance
2. TDRSS Constellation Status
3. Contract Status and Challenges
4. On-Going Upgrade Projects
5. Status of Selected Initiatives
6. Summary

Space Network at a Glance

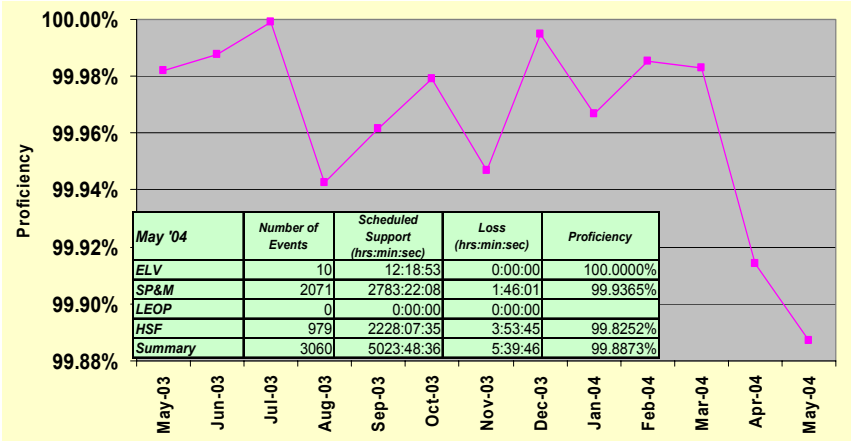


Minutes of Support and Minutes of Data Loss

Total No. of Supported Events

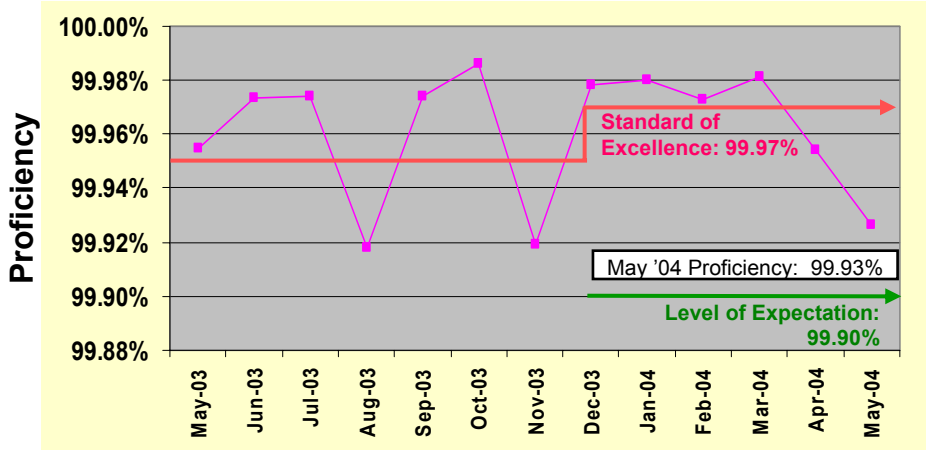


SN Critical Support Proficiency Trend



May '04	Number of Events	Scheduled Support (hrs:min:sec)	Loss (hrs:min:sec)	Proficiency
ELV	10	12:18:53	0:00:00	100.0000%
SP&M	2071	2783:22:08	1:46:01	99.9365%
LEOP	0	0:00:00	0:00:00	
HSF	979	2228:07:35	3:53:45	99.8252%
Summary	3060	5023:48:36	5:39:46	99.8873%

SN Proficiency Trend



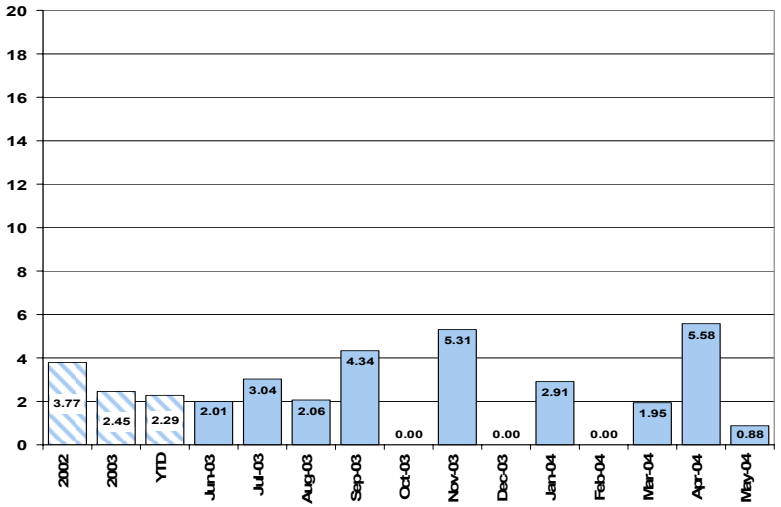
Missions	Total No. of Supported Events	Service Stat.	Proficiency (%)	Standard of Excellence (%)
Aqua, EO-1, ERBS, FUSE, GP-B, HST, ISS, L-7, SP&M, SPTR, TERRA, TOPEX, TRMM, UARS,XTE, Sealaunch, Atlas, P3 (ROCSAT)	**9778**	**11,383 hrs. sched 11,375 hrs. actual 8 hrs. 03 min. lost**	**99.926%**	**99.97%**

Space Network at a Glance

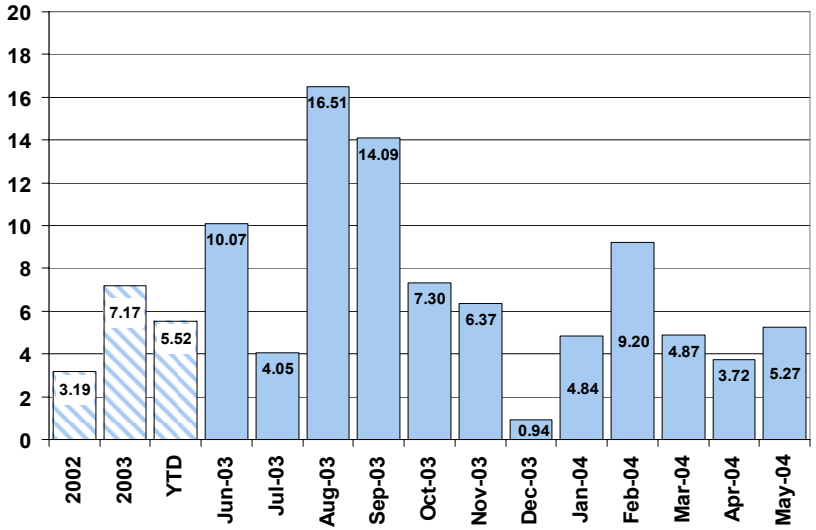
Space Network Error Trends

- Data loss errors only
- Only three error types used
  - Operator error
  - Software error
  - Hardware error
- Normalized to 10,000 hours of support
- Metrics applicable to historical data
- The first two bars are for 2002 and 2003, respectively

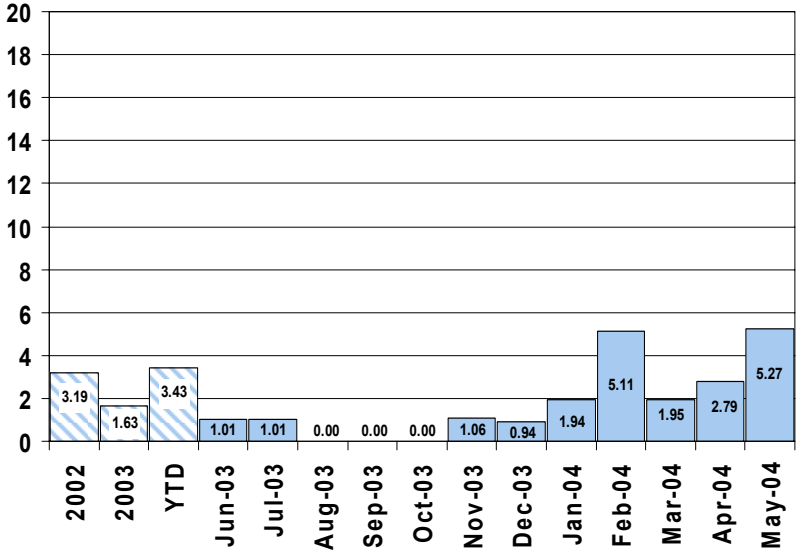
Operator Errors per 10,000 Hours of Support



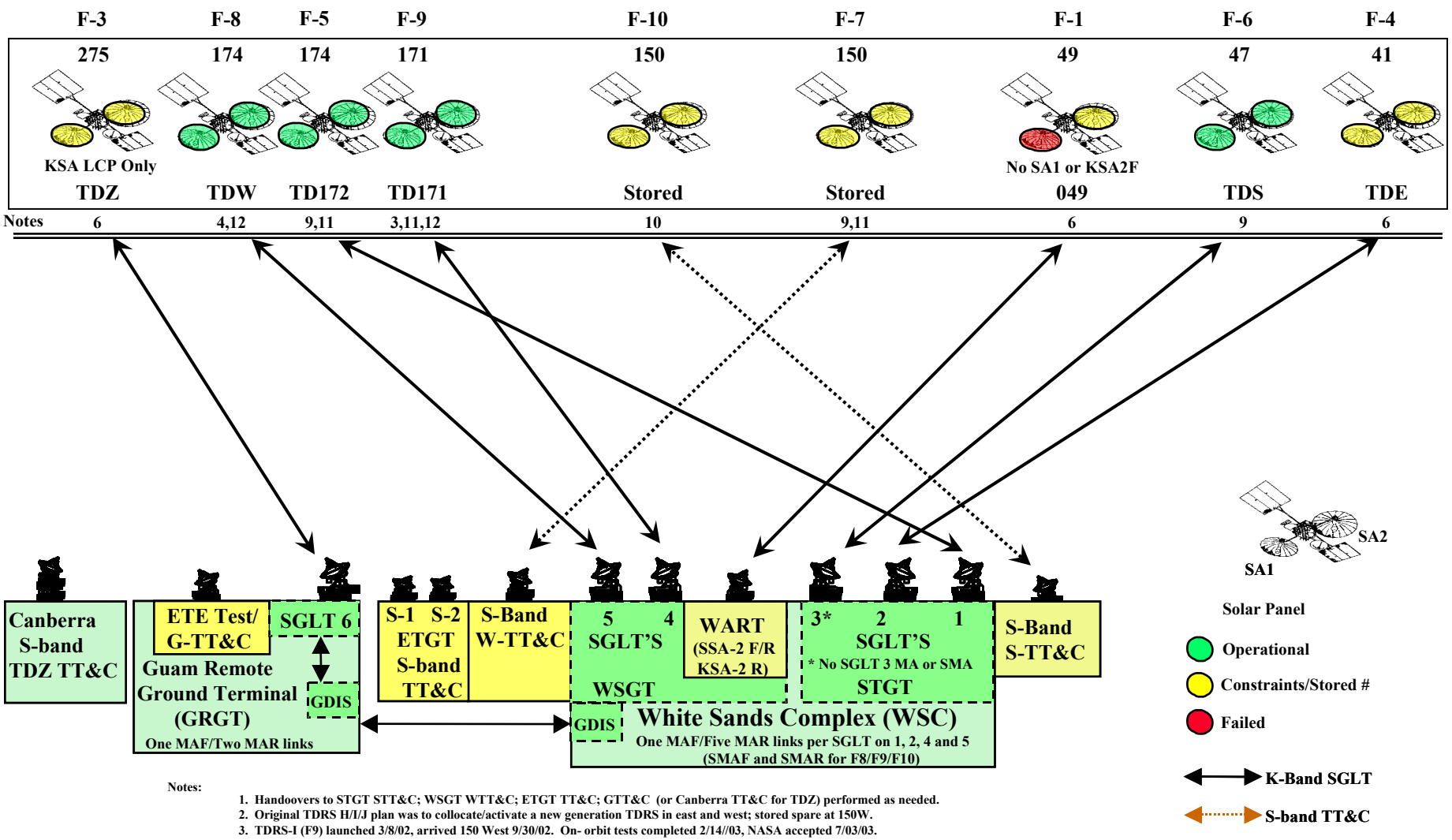
Hardware Errors per 10,000 Hours of Support



Software Errors per 10,000 Hours of Support



TDRS Constellation Status/Configuration - June 2004



Notes:

1. Handoovers to STGT STT&C; WSGT WTT&C; ETGT TT&C; GTT&C (or Canberra TT&C for TDZ) performed as needed.
2. Original TDRS H/I/J plan was to collocate/activate a new generation TDRS in east and west; stored spare at 150W.
3. TDRS-I (F9) launched 3/8/02, arrived 150 West 9/30/02. On- orbit tests completed 2/14//03, NASA accepted 7/03/03.
4. Collocation at 174W; F5/F8. Synchronized drift patterns at 173.6/174.3W.
5. **F8/F9/F10 add SMA (upgraded MA) and Ka** band (time shared with Ku-SA1 or Ku-SA2 services.
6. **KSA service remains restricted to RCP on F1, F3 KSA-1 and F4 per NASA.**
7. **No normal user support available via White Sands** Alternate Resource Terminal (WART).
8. **Dates are based on GMT when events occur near** change of day.
9. F5, F6 and F7 polarization change during an act ive event requires WSC authorization and GCMR/command. F5 authorized for MA Only as TD172
10. TDRS-J (F10) launched 12/5/02; arrived 150.764 West 12/16/02; On-orbit tests completed 5/09/03, NASA accepted 5/29/03.
11. Reconfiguration: TDRS I (F9) 150 to 171West 12/15-1/17/04; TDRS G (F7) 171 to 50W 12/8/03-1/08/04; TDRS-E (F5) 174 to 173.6 W 4/6-4/29/04
12. TDRS-I (F9) operational as TD-171 3/29/04. TDRS–H (F8) backup for two weeks; drift to 174.3 complete 4/21/04; operational as TDW for KSA/SSA/SMA 4/23/04

TDRS Constellation Status and Plans - June 2004

TDRS	Inclination ↑ - Increasing ↓ - Decreasing	Current Operations Designation (Actual Orbit)	Ground Station / SGLT Assignment	Plans
1	11.59° ↑	"Residual Asset" (49.0ºW)	WSGT/WART	Retire by moving to 105ºW or boost to higher orbit.
3	7.88° ↑	TDZ (275.25ºW)	GRGT/SGLT-6	Replace TDRS-1 at 41ºW.
4	5.93° ↑	TDE (41.0ºW)	STGT/SGLT-2	*Move to 47ºW.*
5	5.13° ↑	TDW (173.6ºW)	STGT/SGLT-1	*Move to 171ºW* to complete KSAR, SSAF & SSAR payload investigation.
6	4.39° ↑	TDS (47.0ºW)	WSGT/SGLT-3	*Move to 174ºW* co-locate with TDRS-8.
7	6.58° ↑	Stored (150.5ºW)	WSGT STTC	Replace TDRS-3 at 275ºW.
8	3.95° ↓	174 (174.3ºW)	WSGT/SGLT-5	
9	7.24° ↓	171 (170.7ºW)	WSGT/SGLT-4	Operate through Dec 2004, then move to an east slot (TBD).
10	6.01° ↓	Stored (149.5ºW)	STGT STTC	*Move to 41ºW*. Begin customer operations co-located with TDRS-4 Dec 2004.

Green italic underlined text denotes near term plans

Contract Status and Challenges

- The Near-Earth Network Services (NENS) contract replaced the Consolidated Space Operations Contract (CSOC) beginning with a phase-in period in Oct. 03. The prime contractor is Honeywell Technology Solutions, Inc. (HTSI).
- In general, NENS has been working well for the SN. It is divided into “Core”, which is the M&O portion, and “IDIQ”, which is the NASA-led task portion.
- Major differences from CSOC include:
  - Inclusion of White Sands infrastructure support services in NENS.
  - Clearer delineation of work within Core.
- Challenges to be worked include:
  - Continue to clarify discrimination between Core and IDIQ work for new initiatives.
  - $4M/yr “bid to” number on materials and ODC’s, including obsolete equipment replacement.
  - Lack of efficient mechanism to issue directions, such as a technical direction (TD).

Status of Selected Initiatives

- Bilateration Ranging and Tracking System Augmentation (BRTSA)
- Second Guam Antenna System (SGAS)
- TDRSS K-band Upgrade Project (TKUP)
- Space Network IP System (SNIS)
- Space Network Access System (SNAS)

Bilateration Ranging and Tracking System Augmentation (BRTSA)

- BRTS provides tracking data/information on the TDRS constellation:
  - The tracking units are located in Australia, American Samoa, Ascension Island and White Sands.
- The current system is the original system specified in 1980 and deployed prior to the launch of TDRS-1 in April 1983.
- This effort is an augmentation effort vice a replacement effort - we intend to keep the remaining units of the current system operating as long as practical.
- Depending on the cost of units, the total number of obtained procured is likely to be between three and five.
- The new system will be “functionally identical” to the current BRTSA transponder subsystem, with some options for enhancement, such as the use of GPS receiver.

Second Guam Antenna System (SGAS)

- There are no backup antennas at the GRGT:
  - If a mechanical (pedestal/gear box), electronic (limit switch/motor), or Radio Frequency (RF) (e.g., feed, diplexer) component fail, the site would be down until problem identification and resolution could be completed.
  - As the customer base grows larger for the SN (GRGT), service loss to customers will be amplified in the event of a failure.
- The SGAS effort will:
  - Provide one Space-Ground Link (SGL) dual band antenna in a radome.
  - Provide one End-to-End Test (EET) dual band antenna in a radome.
  - Provide interconnects to switch to/from either SGL/EET antennas.
  - Provide consideration for an additional SGL and EET antenna for future implementation.
  - Provide consideration for an additional SGLT for future service expansion.

TDRSS K-band Upgrade Project (TKUP)

- The Ka-Band Ultra High Rate Data Services project was cancelled in February 2004; the TDRSS K-Band Upgrade Project was created.
- TKUP will provide an enhanced data service, maximizing the data rate through the TDRSS Ku/Ka-Band 225MHz channels by using bandwidth efficient modulation and advanced coding schemes to achieve data rates up to 600Mbps.
- TKUP is considering low-cost options for flight systems for future SN customers. This may include flight system components and emulators compatible with the new TKUP ground system upgrades.
- In addition, TKUP will replace the following obsolete pieces of equipment:
  - KSAR Forward Error Corrector (FEC)
  - High Data Rate Bit Sync
  - High Data Rate Controller
  - High Data Rate Demodulator
  - Adaptive Baseband Equalizer
- TKUP will fulfill the recent data services requirements for the ISS:
  - Col-T
  - JEM

Space Network IP System (SNIS)

- The Space Network IP System will provide an end-to-end communications path for IP customers.
- SNIS:
  - Makes spacecraft systems look and operate just like any other nodes on the IONET.
  - Provides operational IP services that were previously supported only in test and demonstration modes.
  - Enables end-to-end, standard IP communication between all mission resources (e.g. spacecraft, control center, Principal Investigators (PIs)).
  - Enables low-cost individual security solutions tailored to meet the specific needs of each SN mission.
  - Provides more privacy between SN missions on the IONET.

Space Network Access System (SNAS)

- The Space Network Access System (SNAS) is an integrated tool for Space Network service planning, scheduling and monitoring. SNAS:
  - Responds to customer requests to provide a full featured SN scheduling and monitoring tool.
  - Employs standards based systems and software.
  - Can replace outdated and obsolete User Planning Systems (UPSs).
  - Meets the evolved security requirements for NASA networks.
  - Is a logical evolution of the operational SN Web Services Interface (SWSI).

Summary

- The SN provides >10,000 hours of support per month with ~99.95% proficiency using 5 of 9 operational satellites.
- The SN is projected to be operational at least through 2015.
- Upgrades and replacements of hardware and software systems will continue through 2010.
- This timeline could change depending on the start of the TDRSS Continuation Project to replace the current constellation and the ground systems.